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Multiple Linear Regression Analysis of Factors Influencing Written Work Evaluation by SMA Shafta Surabaya

12th Grade Students

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Abstract: *In their final year of high school, 12th-grade students face a critical transition to higher education, making it essential to develop academic writing skills through scientific paper writing. This study aims to identify the factors that significantly influence the assessment of scientific papers written by 12th-grade students at SMA Shafta Surabaya using multiple linear regression analysis. A total of 52 student papers were evaluated based on several aspects, including writing style, creativity of ideas, and quality of discussion. Descriptive analysis showed that discussion had the highest variability, while writing layout and creativity were more consistent. The multicollinearity test confirmed that all predictor variables met the criteria (VIF < 10), indicating no significant multicollinearity issues. Regression analysis revealed that writing style, creativity of ideas, and discussion significantly affected the final evaluation scores (p-value < 0.05). The model showed that a one-point increase in writing style, creativity, and discussion would raise the evaluation score by 3.24, 3.08, and 2.759 points, respectively. These findings emphasize the importance of those factors in scientific writing, making them useful as a reference for improving assessment systems to be more objective and measurable, and as a foundation for teachers and schools to enhance students' writing abilities in a critical, structured, and creative manner. This research also aligns with the Sustainable Development Goals (SDGs), particularly SDG 4 (quality education), SDG 8 (decent work and economic growth), and SDG 9 (industry, innovation, and infrastructure).*

Keywords— Multiple Linear Regression; Write Scientific Papers; Factors Influencing Written Work Evaluation; SMA Shafta Surabaya

1. INTRODUCTION

In the modern era, which increasingly demands critical and analytical thinking skills, especially from the younger generation, students are required not only to receive information but also to process that information into useful knowledge. In the final year of high school, specifically in the 12th grade, students are in a transitional phase towards further education. Therefore, it is very important for them to be equipped with skills that support academic and professional readiness. One effective way to provide this preparation is through learning to write scientific papers. Thus, the assessment of students' written works is a crucial element in education, as it reflects critical thinking skills, mastery of methodology, and written communication skills [1]. At the 12th grade high school level, written assignments serve as a benchmark for the development of Higher Order Thinking Skills (HOTS) and preparation for further education [2].

SMA Shafta Surabaya, as one of the educational institutions that emphasizes the development of academic literacy skills, demands a writing evaluation system that is fair, objective, and based on measurable indicators. However, the evaluation still has the potential for subjective bias, influenced by various factors such as writing structure, content quality, use of references, and the evaluator's perception [3]. Therefore, it is important to identify and analyze the factors that significantly influence the assessment results. This analysis will not only help improve the quality of the evaluation process but can also serve as a foundation for curriculum and learning strategy improvements. This research is also aligned with the Sustainable Development Goals (SDGs), particularly SDG No. 4 (quality education), SDG No. 8 (decent work and economic growth), and SDG No. 9 (industry, innovation, and infrastructure), by analyzing the factors that influence the assessment of the written works of 12th-grade students at SMA Shafta Surabaya.

To gain a deeper understanding of the factors influencing the evaluation results of students' written works, a multiple linear regression method was used to explore the impact of independent variables such as writing structure, content quality, use of scientific literature, grammar, and presentation skills on the final evaluation scores of the written works [4]. With this quantitative approach, it is expected to obtain an

accurate empirical picture of the most dominant factors influencing the assessment results, which can ultimately be used as a basis for developing more objective and measurable evaluation standards. The findings from this analysis not only provide academic benefits but also practical ones, particularly as constructive input for teachers in giving feedback, for students in producing higher-quality written work, and for school authorities in designing strong competency-based academic learning policies.

2. METHOD

2.1 Data Source

The data used in this study are secondary data obtained from the assessment results of a scientific writing practical exam conducted by 12th-grade students of Shafta Islam Senior High School, Surabaya. The assessment took place on February 18, 2025, as part of a science exhibition event organized by the school.

The data consist of the students' scientific papers evaluated by a panel of judges, based on specific aspects aligned with the predetermined assessment criteria set for the event.

2.2 Analysis Stage

The data analysis in this research is carried out through the following stages.

1. **Descriptive Statistics.** This initial step provides an overview of the data by summarizing key characteristics of each variable. It includes measures such as the mean, minimum, maximum, and standard deviation. These statistics help identify the general pattern of the data and detect any possible outliers or extreme values.
2. **Multicollinearity Test.** A multicollinearity test is conducted to check whether there are strong correlations among the independent variables. This is done using VIF (Variance Inflation Factor) values. In this research, variables with VIF values below 10 are considered acceptable and free from serious multicollinearity issues.
3. **Regression Analysis.** At this stage, a multiple linear regression model is developed to examine the simultaneous influence of several independent variables on the dependent variable. The analysis involves:
   - Testing the significance of each independent variable using a t-test.
   - Conducting an F-test to evaluate the overall significance of the model.
   - Assessing the model's explanatory power using R-squared and adjusted R-squared values.
4. **Interpretation.** The final step interprets the results to explain how each significant factor affects the evaluation scores.

3. RESULT AND DISCUSSION

3.1 Descriptive Statistics

Based on the evaluation data of scientific works from 52 12th-grade students at SMA Shafta Surabaya, descriptive statistical analysis will be conducted to obtain an overview of the data used. The following are the descriptive statistics of the data.

Table 1 : Descriptive Statistics

Variables	Mean	Standard Deviation	Minimum	Maximum
Writing Layout	2,88	0,5479	2	4
Creativity	7,09	0,5427	6	8
Discussion	62,8	6,183	43.5	73.5
Total	7,07	1,016	5	9

Based on Table 1, the highest average score is found in the Discussion variable at 62.8 with a standard deviation of 6.183, indicating a variation in discussion abilities among participants. Meanwhile, the Writing Layout variable has the lowest average score of 2.88 with a standard deviation of 0.5479, with scores ranging from 2 to 4. The Layout and Creativity variables both have an average of 7.09 and a standard deviation of 0.5427, with scores ranging from 6 to 8, indicating consistent and relatively high evaluations. The Total Score has an average of 7.07 with a standard deviation of 1.016, with a minimum value of 5 and a maximum of 9. In general, these results indicate good performance in the aspects of creativity and layout, but there is considerable variation in discussion skills.

3.2 Multiple Linear Regression

Before modeling using multiple linear regression, multicollinearity testing is first performed to ensure that there are no strong linear relationships between the predictor variables used. One common method for detecting multicollinearity is to examine the Variance Inflation Factor (VIF) values. The VIF values for each variable are presented in Table 1 below.

Table 2 : Multicollinearity Test

Variable	VIF
Writing style (X_1)	1.57
Creativity of Ideas (X_2)	1.7
Discussion (X_3)	1.73

According to general criteria, if the VIF value is less than 10, it can be concluded that there is no multicollinearity. The results in Table 1 show that all predictor variables have VIF values below 10. Therefore, it can be concluded that there is

no multicollinearity issue in the data used, allowing the analysis process to proceed to the multiple linear regression stage.

A linear regression model that contains $(p-1)$ predictor variables and one response variable is called a multiple linear regression model. The general form of a multiple linear regression model is:

$$y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \cdots + \beta_{p-1} X_{i,p-1} + \varepsilon_i \qquad (1)$$

The following is the significance test for the parameters or predictor variables of the multiple linear regression model based on the output displayed in the Minitab software:

Table 3 : Significance Testing of Parameters

Source	DF	F-Value	P-Value
Regression	3	43.3	0.000
Writing style	1	9.28	0.004
Creativity of Ideas	1	7.65	0.008
Discussion	1	21.13	0.000
Error	48		
Total	51		

The following is the hypothesis formulation to test whether the predictor variables simultaneously influence the response variable:

H_0: $\beta_1 = \beta_2 = \beta_3 = 0$
H_1: There is at least one $\beta_i \neq 0$ for $i = 1,2,3$

With the critical region being Reject H_0 if the p-value is smaller than the 5% significance level.

Based on the output in Minitab, the p-value is 0.000, which is smaller than the 5% significance level. Therefore, the decision to reject H_0 can be made, concluding that there is at least one predictor variable that significantly influences the response variable or that the predictor variables collectively significantly influence the response variable.

The β calculation results in the multiple linear regression model can also be seen in the Minitab software output. The multiple linear regression parameter coefficients are as follows :

Table 4 : Coefficient of Parameters

Term	Coef	SE Coef
Constant	12.11	6.15
Writing style (X_1)	3.24	1.06
Creativity of Ideas (X_2)	3.08	1.11
Discussion (X_3)	2.759	0.6

Based on the output and calculations above, the multiple linear regression equation that can be used to model Work Evaluation in SMA Shafta Surabaya is as follows :

$$\hat{y} = 12.11 + 3.24(X_1) + 3.08(X_2) + 2.759(X_3) \qquad (2)$$

Based on the multiple linear regression equation above, the interpretation of the parameter coefficients :

1) If the Writing style point increases by one unit, the Work evaluation will increase by 3.24 with other predictor variables held constant.
2) If the Creativity of Ideas point increases by one unit, the Work evaluation will increase by 3.08 with other predictor variables held constant.
3) If the Discussion point increases by one unit, the Work evaluation will increase by 2.759 with other predictor variables held constant.

If the simultaneous test results are significant, then proceed with individual tests for each predictor variable. The following is the hypothesis formulation to test whether the predictor variables have a significant effect on the response variable:

$H_0 : \beta_i = 0$
$H_1 : \beta_i \neq 0$

The null hypothesis is rejected if the p-value is less than the significance level of 5%. Thus, the partial test results are as follows :

Table 5 : Partical Test Result

Term	T-Value	P-Value
Constant	1.97	0.055
Writing style (X_1)	3.05	0.004
Creativity of Ideas (X_2)	2.77	0.008
Discussion (X_3)	4.6	0.000

Based on Table 5, it can be seen that the variables of writing style, creativity of ideas, and discussion have p-values < 5%, resulting in the decision to reject H_0 This leads to the conclusion that the variables of writing style, creativity of ideas, and discussion have a significant effect on work evaluation at SMA Shafta Surabaya.

4. CONCLUSION

This research uses multiple linear regression analysis to identify factors that significantly influence the assessment of scientific papers of 12th grade students of Shafta Surabaya High School. Based on the results of the analysis and discussion in this study, it can be concluded that writing style, creativity of ideas, and quality of discussion have a significant effect on the assessment of scientific papers of 12th grade students of Shafta Surabaya High School. Through multiple linear regression analysis of 52 scientific papers, it was found that the three variables simultaneously and partially had a significant influence on the final assessment score, with a p value <0.05 in all statistical tests performed. The regression model showed that each one-point increase in writing style, creativity of ideas, and discussion would increase the evaluation score by 3.24; 3.08; and 2.759 points, respectively. This finding indicates that these aspects are important factors that must be considered in writing scientific papers. Therefore,

the results of this study can be used as a reference in improving the scientific writing evaluation system to be more objective and measurable, as well as a basis for teachers and schools to foster students' ability to write more effectively, critically, and creatively.

5. REFERENCES

[1] Aflah, F. R., Risnawati, R., & Hamdani, M. F. (2025). Application of multiple linear regression in assessing relationships between variables in quantitative research, Innovative: Journal of Social Science Research, vol. 5, no. 3, pp. 4195–4211. (Penerapan regresi linier berganda dalam menilai hubungan antar variabel dalam penelitian kuantitatif).

[2] Hariningsih, R. R. K., & Chandrasari, D. M. (2024). Evaluation of student academic achievement through activeness and quizzes: A multiple linear regression analysis, Joined Journal (Journal of Informatics Education), vol. 7, no. 2, pp. 249–256. (Evaluasi prestasi akademik mahasiswa melalui keaktifan dan kuis: Analisis regresi linear berganda).

[3] Juliani, E. P., Elrika, A. J., Anggraeni, N., Nasrullah, S. A. Z., Aziz, M. S. R., & Amaliyah, F. (2024). The effect of motivation and learning interest on mathematics learning outcomes using multiple linear regression test, MathVision: J. Mat., vol. 6, no. 2, pp. 102–109. (Pengaruh motivasi dan minat belajar terhadap hasil belajar matematika menggunakan uji regresi linear berganda).

[4] Rahmatullah, S., Juningsih, E. H., & Rachmawati, S. (2023). Prediction of students' academic performance during the COVID-19 pandemic using multiple linear regression, J. Inf. Syst. Appl. Manag. Account. Res., vol. 7, no. 1, pp. 112–123. (Prediksi nilai akademik peserta didik di masa pandemi COVID-19 dengan regresi linier berganda).